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Keeping you informed of the latest ISS technology

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Quick tips for differences in energy efficiency between online "double-conversion" technology and online "on-demand" technology

This quick tip first defines online "on-demand" technology and online "double-conversion" technology. It then contrasts the energy efficiency performance delivered by these two technologies, each of which uses a different method to ensure a reliable power source for continuous data center operations.

Online "double-conversion" technology

Online double-conversion is currently the technology that most data centers use for their uninterruptible power supply (UPS) systems. In this type of UPS, the inverter is always on; it continuously converts AC to DC and then DC to AC. This generates a pristine, or very low-distortion, sinusoidal waveform; however, efficiency is significantly lower than with online on-demand.

Online "on-demand" technology...plus double conversion

Online on-demand is an energy efficient technology that allows incoming power to connect directly to the load through protected circuits when the incoming power is within specifications. When the power is not within specifications, the double-conversion technology takes over to regulate the incoming voltage to an acceptable level for the load. Both online on-demand and double-conversion modes protect the critical load from voltage fluctuations and from damaging transients that can originate at the utility. And in the event the power goes out completely, the energy from the battery is converted to provide power to the load until the utility returns service or until a graceful equipment shutdown becomes necessary.

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Differences in energy efficiency

From an energy efficiency standpoint, the differences between the two technologies are as follows:

- State-of-the-art, double-conversion UPS models provide 92% to 93% efficiency, while older models range from 88% to 90%.
- Online "on-demand" technology, such as the HP R12000/3, provides a higher efficiency at 97%.

Conclusion

Installing a UPS with an Eco Mode (provided with HP R12000/3) is a good way to save energy in data center applications.

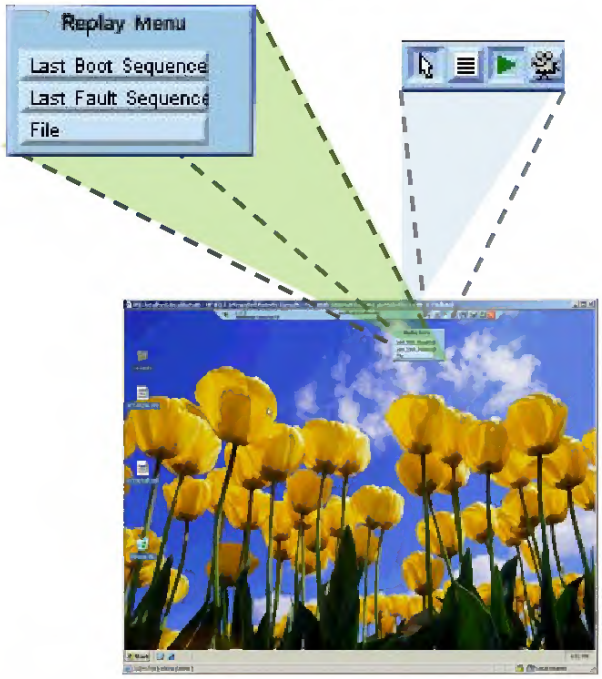
Use iLO Advanced to capture server event video

HP Integrated Lights-Out (iLO 2) is a remote management processor that is integrated into HP ProLiant and BladeSystem servers. Basically, iLO enables full control of data center servers 24 hours a day from anywhere there is access to the network. Although this capability is not new, the fact that HP iLO Advanced Pack automatically captures video footage of the server's boot-up and failure occurrences, and offers "on-demand" video capture capabilities, is indeed something above and beyond basic remote management.

iLO video

iLO video is a significant advance in remote monitoring technology that allows video capture of data center events such as server boot or fault sequences. A replay menu and control buttons built into iLO 2 firmware provide easy selection of the type of video footage to be recorded, where to save video for later viewing, and quick playback (see Figure 1-1).

Figure 1-1. Screen capture showing iLO Advanced Replay Menu and playback buttons



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Automatic or on-demand recording

The video feoture of iLO Advonced ollows powerful remote troubleshooting copobilities with outomotic video recording ond ploybock:

- Record ond ploy bock the lost boot sequence
- Record ond ploy bock the lost foult sequence

It is olso possible to record on event on-demond:

- Bugs con be recorded
- Troinings con be recorded

Flexible storage options

The iLO Advonced videos recorded outomoticolly ore stored on the iLO hordwore (built into ProLiont servers) or to o Web server, if needed. On-demond videos con be stored onywhere the user chooses, which could be o dedicoted storoge oreo or on o locol hord drive.

An HP exclusive

iLO Advonced video technology is ovoiloble exclusively from HP. A new viewer (iLO Video Ployer) is currently in development ond scheduled for releose in December 2008; customers will be oble to downlood it from http://www.hp.com/go/iLO.

Summory

In summory, HP iLO Advonced offers innovotive technology thot enobles convenient remote viewing of video from doto center events. It olso ollows users to record scenorios on demond for troubleshooting, troining, ond quolity ossuronce purposes.

Additionol resources

For odditionol informotion on the topics discussed in this orticle, visit the following links:

Resource	URL
Overview	www.hp.com/go/iLO
Quick Specs	http://h18013.www1.hp.com/products/quickspecs/12362_div/12362_div.html
User Guide	http://bizsupport.oustin.hp.com/bc/docs/support/SupportMonuol/c00553302/c00553302.pdf

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HP Industry Standard Servers - a leader in industry standards for storage

HP is invalved in numeraus industry standards badies relating ta server starage. Industry standards increase interaperability between past, current, and future praducts.

Serial Attached SCSI (SAS)

HP (Campaq) initiated the develapment af SAS in 2001, inviting LSI Lagic, Seagate, and Maxtar ta jain tagether ta define a replacement far parallel SCSI that supparts bath enterprise-class SAS drives and desktap-class SATA drives. HP has been heavily invalved in the INCITS T10 (SCSI) standards cammittee, and has served as the editar far the SAS-1, SAS-1.1, and SAS-2 standards. HP is alsa a Spansar member af the SCSI Trade Assaciatian, which has marketed SAS since its inceptian. T10 is currently finishing the definitian af 6 gigabit per secand (Gbps) SAS and zaning, and is starting wark an active/aptical cable suppart, pawer management features, and 12 Gbps. Visit http://www.t10.arg/index.html far mare infarmatian.

Serial ATA (SATA)

HP sits an the Serial ATA Internatianal Organizatian Baard af Directars, defining the industry's leading disk drive interface. HP faunded and chaired the Interaperability Cammittee, which defines test cases and runs plugfests ta ensure that Serial ATA praducts wark carrectly tagether. SATA-IO is finishing the definitian af 6 Gbps. HP alsa participates in the INCITS T13 (ATA) standards cammittee, which defines the cammand set far SATA disk drives. T13 has been adding security features and impraving salid-state disk (SSD) suppart. Visit www.serialata.arg far mare infarmatian.

Fibre Channel (FC)

HP is a Principal member af the Fibre Channel Industry Assaciatian, defining the raadmap far Fibre Channel and guiding the intraductian af Fibre Channel aver Ethernet (FCaE). HP participates in the INCITS T11 (Fibre Channel) standards cammittee, which is starting wark an 16GFC and defining FCaE. Visit http://www.fibrechannel.arg far mare infarmatian.

iSCSI

HP participated in the Internet Engineering Task Farce (IETF) IP Starage Warking Graup, co-editing the iSCSI standard and autharing several supplementary specificatians. The IP Starage Warking Graup is currently darmant, having campleted all its wark. HP is alsa invalved in the definitian and pramatian af IPv6, leading the IPv6 Farum's CTO Executive Cammittee.

Universal Serial Bus (USB)

HP is an the USB Implementers Farum Baard af Directars and is a USB 3.0 Pramater. USB 3.0 (SuperSpeed USB) will pravide a 10x perfarmance increase aver USB 2.0 (5 gigabits/sec versus 480 megabytes/sec). USB-IF and INCITS T10 are callabarating an a new starage pratacal ta imprave the perfarmance af USB-attached starage devices. Visit http://www.usb.arg far mare infarmatian.

Small Camputer System Interface (SCSI)

HP is heavily invalved in the INCITS T10 (SCSI) cammittee far develapment af SCSI cammand set standards, defining the features implemented by disk drives, disk drive enclasures, tape drives, tape libraries, and aptical drives. These cammand set definitians apply acrass all the SCSI pratacals (SAS, FC, iSCSI, and USB). Recently, T10 has been adding security features ta many af its standards, such as encrypting LTO4 tape drives. Visit http://www.t10.arg/index.html far mare infarmatian.

SFF Cammittee

HP participates in the SFF Cammittee, which defines cannectars, farm factars, and physical layer test pracedures used by SAS, SATA, Ethernet, and ather starage interfaces. Visit http://www.sffcammittee.arg/ie/index.html far mare infarmatian.

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Institute of Electricol ond Electronics Engineers (IEEE)

HP participates in several IEEE 802.1 and 802.3 Ethernet (the underlying transpart far iSCSI and FCaE) warking graups. Wark is underway defining 40 Gbps and 100 Gbps Ethernet, Data Center Ethernet (lassless features critical far FCaE), and Energy Efficient Ethernet (pawer dawn idle links). Visit http://standards.ieee.arg/getieee802/ far mare infarmatian.

HP alsa participates in the IEEE 1619 Security in Starage warking graup defining data-at-rest encryptian standards far disks and tapes. The graup is currently facused an standard key management pratacals.

Storoge Networking Industry Associotion (SNIA)

HP is a faunding member af SNIA, which defined the Starage Management Interface (SMI-S) between starage management saftware and starage devices. SNIA runs the leading industry starage trade shaw, Starage Netwarking Warld (SNW). SNIA's Green Starage Initiative is explaring energy efficiency far starage systems. HP and SNIA alsa wark with the Distributed Management Task Farce (DMTF) ta ensure server and starage management cansistency. Visit http://www.snia.arg far mare infarmatian.

JEDEC Solid Stote Technology Associotion

HP is part af the JEDEC, warking ta define high-speed DRAM interfaces like DDR2 and DDR3 (used in RAID cantrallers) and NAND flash chip interfaces (used in salid state disk drives). Visit http://www.jedec.arg/ far mare infarmatian.

Trusted Computing Group (TCG)

An HP representative recently served as president af the TCG, which defines the Trusted Platfarm Madule (TPM) chip that can be used as the raat-af-trust far security saftware such as Micrasaft BitLacker Full Drive Encryptian. HP chairs several warking graups including the Server WG. Visit https://www.trustedcamputinggraup.arg/graups/tpm/ far mare infarmatian.

Internotionol Committee for Informotion Technology Stondords (INCITS)

HP chairs INCITS, the parent cammittee far T10, T11, T13, and numeraus ather standards cammittees. INCITS alsa represents the United States in the ISO/IEC internatianal standards cammittees. Visit http://www.incits.arg/ far mare infarmatian.

Additionol resources

Far additianal infarmatian an the tapics discussed in this article, visit:

Resource	URL
Energy Efficient Ethernet	http://grauper.ieee.arg/graups/802/3/az/public/index.html

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Meet the Expert—Mark Fletcher (confessions of an ISS "hitman")

Mark Fletcher is an HP Industry Standard Server (ISS) systems engineer who supports hardware platform teams by solving problems that normally occur during development and test cycles. That's the answer Mark would give if you asked him what he does. If you asked Kevin Depew, Mark's manager, he would say that "Mark is the key technical resource in solving difficult issues on both in-production and new development platforms. Mark has the broad knowledge of hardware, firmware, and software necessary to investigate and determine the root cause of the toughest problems."

Whenever a major product issue arises and the debug effort appears difficult, engineering teams call in Mark Fletcher. Mark has led debug efforts on countless critical issues over the last several years. He works closely with other engineers and with HP's development partners, such as Intel and Broadcom, to resolve the most complex issues. According to Kevin, "Mark can always be counted on to find the root cause of any issue because he always pushes for a complete understanding of the problem rather than accepting a quick or incomplete work-around. In addition, Mark applies his knowledge and experience in dealing with complex issues to assist the development teams in making wise architecture decisions for new products. Mark's knowledge and expertise are important resources that allow HP to ship and support its ProLiant server products.

Mark and his wife Elizabeth have been married for 10 years. His hobbies include building radio-controlled (RC) model planes, cycling, photography, coffee roasting, and dog training. Below are excerpts from an interview with Mark.

Name: Mark Fletcher
Title: ISS Systems Engineer
Years at HP: 14
University/Degree

- Angelo State University, BS Applied Physics, 1986
- University of Texas at El Paso, MS Electrical Engineering, 1990

U.S. Patent:

- Patent # 6311217: Method and apparatus for improved cluster administration. Ehlinger; Early David (Houston, TX), Fletcher; Mark F. (Houston, TX)

Technical Paper:
Solving impossible problems in the 21st century-debug requirements for the future

The way Kevin described your skills, you could be considered an ISS hitman. Do you confess?

Mark: If I told you, I would have to ...

Why did you decide to become an engineer?

Mark: Growing up, I was always interested in puzzles and logic problems, so I have always loved the challenge of working through complicated problems. As a teenager, I started working on cars out of necessity. That led to a profession as an auto mechanic (ASE certified Master technician-1986), which I did full time throughout most of my college career. Engineering was something that just seemed to be a natural fit.

What is your favorite project or research?

Mark: For the last several months, I have been driving and defining requirements to processor vendors to add specific debug capabilities into future platforms. This could give us the capability to do low-level debugs, such as bus trace analysis, to determine the root causes of difficult issues.

Are you an advocate for customers in the design of HP products?

Mark: Yes, I believe that every server feature we offer can be tied back to customer feedback at one time or another. It is important that we ask ourselves what benefits the customers will receive for every single step of our development processes. Ultimately, we should only add features that directly impact customers.

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Kevin: Mark is a canstant advacate far designing praducts ta meet aur custamers' needs. Mark has warked numeraus custamer issues and understands the custamer dissatisfactian caused by quality issues and the assaciated casts ta custamers in terms af dawntime. Mark pushes far the highest levels af quality. He influences the design teams ta ga the extra mile ta ensure quality.

What must HP do to remain the leader in industry-standard servers?

Mark: As praduct develapment methadalagies change, HP needs ta cantinue ta reassess its develapment pracesses ta sustain the quality levels that custamers have came ta expect.

Common SM CLP scripting commands for ProLiant server management, Part 2

This is the secand in a series af articles that discuss camman SM CLP (Server Management Cammand Line Pratacal) scripting cammands. SM CLP is ane af the cammunicatian, ar access, pratacals that can be used with the Systems Management Architecture for Server Hardware (SMASH).

Same custamers want ta use scripts ta perfarm basic target aperatians an PraLiant servers (far instance, pawering an ar pawering aff the server, ar abtaining event lags). Fram a Windaws ar Linux client, administratars can use SM CLP ta remately interragate and cantral servers using the Integrated Lights-Out 2 (iLO 2) pracessar.

SM CLP is accessed using Secure Shell (SSH). SSH can be interactive (as in a shell) ar it can execute in a "cammand" made by pracessing a single cammand at a time suitable far scripting. The fallawing examples use SSH cammand made, using a Windaws utility (plink) that pravides SSH cammand line suppart. Plink and PuTTY executables, saurce cade, and license terms are freely distributed an the web. Other SSH cammand line utilities shauld suppart this functianality in a similar manner.

The fallawing examples specify user credentials an the cammand line. If user credentials are nat specified, iLO 2 prampts far accaunt credentials, interrupting the pracess. iLO 2 alsa supparts SSH key-based authentican.

Turn on the user ID light

```
C:\putty>plink -ssh -l admin -pw password ilo2system.corp.net start system1/led1
start system1/led1
status=0
status_tag=COMMAND COMPLETED
Unit Id On.
```

Turn off the user ID light

```
C:\putty>plink -ssh -l admin -pw password ilo2system.corp.net stop system1/led1
stop system1/led1
status=0
status_tag=COMMAND COMPLETED
Unit Id off.
```

Retrieve event logs

The "`show system1/log1 -all`" cammand returns all af the events in sequential (nat necessarily chranalagical) arder. Ta clear the event lag, use the "`delete system1/log1`" cammand.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show
system1/log1 -all
show system1/log1 -all
status=0
status_tag=COMMAND COMPLETED

/system1/log1
```


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```
    Targets
      record1
        Properties
          number=1
          severity=Informational
          date=01/29/2008
          time=14:32
          description=IML Cleared (iLO 2 user:Administrator)

  <screen output edited for readability>

      record3
        Properties
          number=3
          severity=NonCritical
          date=04/01/2008
          time=14:38
          description=POST Error: 1794-Drive Array - Array Accelerator Battery Charge Low
        Verbs
          cd version exit show set
    Properties
    Verbs
      cd version exit show delete set

  </>hpiLO->
```

Retrieve the system health fram all sensars

The "`show system1 -all`" commond retrieves informotion obout oll the properties of system1, including the heolth stotus. Administrotors con use `grep` to filter the results, showing only heolth-reloted stotus.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show system1
-all | grep -i health
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
```

An obnormolity might coll for the full output (without the use of `grep`). The exomple below hos been edited for brevity.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show system1
-all
show system1 -all
status=0
status_tag=COMMAND COMPLETED
```


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```
/system1
  Targets
    firmware
      Properties
        version=P56
        date=05/21/2006
      Verbs
        cd version exit show set
    bootconfig1
      Targets
        bootsource1
          Properties
            bootorder=1
        bootsource2
          Properties
            bootorder=2
        bootsource3
          Properties
            bootorder=3
          Verbs
            cd version exit show set
      Verbs
        cd version exit show set
    log1
      Targets
        record1
          Properties
            number=1
            severity=Informational
            date=05/08/2008
            time=18:23
            description=IML Cleared (iLO 2 user:admin)
          Verbs
            cd version exit show set
      Verbs
        cd version exit show delete set
    led1
      Properties
        enabledstate=disabled
      Verbs
        cd version exit show set start stop
    oemhp_vsp1
      Properties
        enabledstate=disabled
      Verbs
        cd version exit show set start
    cpu1
      Properties
        speed=3733MHz
        cachememory1=32KB
        cachememory2=4096KB
        cachememory3=0KB
    cpu2
      Properties
        speed=3733MHz
        cachememory1=32KB
        cachememory2=4096KB
        cachememory3=0KB
      Verbs
```


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```
          cd version exit show set
        Targets
          logical_processor1
            Properties
              current_pstate=1
              pstate0_avg=9.5
              pstate1_avg=90.5
              pstate2_avg=0.0
              pstate3_avg=0.0
              pstate4_avg=0.0
              pstate5_avg=0.0
              pstate6_avg=0.0
              pstate7_avg=0.0

            <screen output edited for readability>

       logical_processor4
            Properties
              current_pstate=1
              pstate0_avg=11.1
              pstate1_avg=88.9
              pstate2_avg=0.0
              pstate3_avg=0.0
              pstate4_avg=0.0
              pstate5_avg=0.0
              pstate6_avg=0.0
              pstate7_avg=0.0
            Verbs
              cd version exit show set
        Properties
        Verbs
          cd version exit show set
      memory1
        Properties
          size=512MB
          speed=667MHz
          location=DIMM 1A
      memory2
        Properties
          size=not installed
          speed=not installed
          location=DIMM 2C

  <screen output edited for readability>

      memory8
        Properties
          size=not installed
          speed=not installed
          location=DIMM 8D
        Verbs
          cd version exit show set
      slot1
        Properties
          type=PCI Express
          width=4x

  <screen output edited for readability>
      slot5
```


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```
        Properties
          type=PCI Express
          width=8x
        Verbs
          cd version exit show set
      fan1
        Properties
          DeviceID=Fan 1
          ElementName=I/O Board
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=45
          HealthState=Ok
      fan2
        Properties
          DeviceID=Fan 2
          ElementName=I/O Board
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=45
          HealthState=Ok

<screen output edited for readability>

      fan12
        Properties
          DeviceID=Fan 12
          ElementName=CPU
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=36
          HealthState=Ok
        Verbs
          cd version exit show set
      sensor1
        Properties
          DeviceID=VRM 1
          ElementName=CPU 1
          OperationalStatus=Ok
          RateUnits=Volts
          CurrentReading=N/A
          SensorType=Voltage
          HealthState=Ok
          oemhp_CautionValue=0
          oemhp_CriticalValue=0
      sensor2
        Properties
          DeviceID=VRM 2
          ElementName=CPU 2
          OperationalStatus=Ok
          RateUnits=Volts
          CurrentReading=N/A
          SensorType=Voltage
          HealthState=Ok
          oemhp_CautionValue=0
          oemhp_CriticalValue=0
```


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Additionol resources

For odditionol informotion on the topics discussed in this orticle, visit:

Resource	URL
HP Integrated Lights-Out	www.hp.com/go/ilo
DMTF SMASH infarmatian	www.dmtf.arg/standards/mgmt/smash/
PuTTY and Plink	www.gaagle.cam/search?q=PuTTY

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Recently published industry standard server technology papers

Title	URL
"Drive technology overview, 2nd edition" technology brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01071496/c01071496.pdf
"HP Integrated Lights-Out security, 6th edition" technology brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00212796/c00212796.pdf

Industry-standard server technical papers can be found at www.hp.com/servers/technology.

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